

REMARKS

Claims 1-2 have been amended. Claims 1-5 remain for further consideration. No new matter has been added.

The objections and rejections shall be taken up in the order presented in the Official Action.

2-3. Claims 1-5 currently stand rejected for allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter deemed to be the present invention.

The claims have been amended to remove the alleged indefinite language.

4-5 Claims 1-4 currently stand rejected for allegedly being anticipated by Klink's "Honen von Zylinderbohrungen aus GGV" (hereinafter "Klink").

Claim 1

Amended claim 1 recites:

"a method of machining the circumferential surface of a bore by rough-honing using a honing tool received by an overhung-mounted working spindle and provided with honing stones, said working spindle having a longitudinal axis (M_A) and said honing stones being feedable in radially outward direction, in which, at the start of the machining process, the honing tool is inserted eccentrically into the bore such that the longitudinal axis (M_B) of the bore has a certain offset (S) from the axis (M_A) of the working spindle and the honing stones only partially work along the circumferential surface of the bore in a partial cut, and, when the honing stones are pressed in said radially outward direction during the machining process, the longitudinal axis of the bore (M_B) approaches the longitudinal axis of the working spindle (M_A) until the circumferential surface of the bore is machined with complete coverage everywhere in a full cut eliminating the offset (S) and any angle between the axes (M_A, M_B), and subsequently the circumferential surface is uniformly honed with said full cut." (cl. 1; emphasis added).

The Official Action contends that “*the article ‘Honen von Zylinderbohrungen aus GGV’ appears to show boring of cylinders with a first step of rough honing with an eccentrically disposed honing tool, and expansion of the tool as the eccentricity of the bore tends toward zero. Note figure 5 which shows the initial eccentric relationship of the bore and honing tool axes prior to expansion of the tool.*” (Official Action, pgs. 2-3).

Note that an English-language translation of the cited section of Klink that includes FIG. 5 is being provided concurrently herewith in an Information Disclosure Statement.

Upon a fair and proper reading, Klink fails to anticipate amended claim 1 because Klink fails to disclose the emphasized features of amended claim 1 noted above. FIG. 5 of Klink illustrates an axial offset “b” (whose length is defined by the two circles – an upper and lower circle) between the axis “a” of the honing spindle (i.e., the “doubly articulated tool holder) and the axis of the upper tool guide “c”. This offset is maintained throughout the entire bore machining operation in Klink. Indeed, English-language translation of the cited section of Klink states “*above the upper guidance a double joint can provide for the offset between the axis of the spindle and the axis of the tool.*” Thus, it can be seen from FIG. 5 of Klink that the center of the resulting machined bore is determined by the upper tool guide “c” and the lower tool guide “e” working in tandem, and is not determined in any manner by the axis of the spindle or tool holder “a”.

In contrast, the method of amended claim 1 recites the features that during machining of the circumferential surface of the bore, the longitudinal axis (M_B) of the bore approaches the longitudinal axis (M_A) of the working spindle and any offset (S) and any angle between these axes are both eliminated. These features are not disclosed or suggested by Klink. Also, these features have the added practical benefit of providing a relatively simpler tool and corresponding

method of machining the bore. Further, as a consequence of the overhung mounting of the tool, the lower tool guide "e" of Klink is not needed. This has the significant advantage of allowing the method of amended claim 1 to machine a bore in a piece (e.g., an engine block) in which the bore is only accessible from one direction (i.e., from above) and not also from below. In light of the foregoing, it is respectfully submitted that Klink is incapable of anticipating amended claim 1.

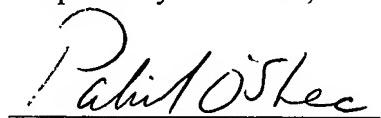
6-7. Claim 5 currently stands rejected for allegedly being obvious in view of Klink and U.S. Patent 5,331,775 to Carmichael (hereinafter "Carmichael").

It is respectfully submitted that the rejection of this claim is moot, since claim 5 depends indirectly from amended claim 1, which is patentable for at least the reasons set forth above.

For all the foregoing reasons, reconsideration and allowance of claims 1-5 is respectfully requested.

If a telephone interview could assist in the prosecution of this application, please call the undersigned attorney.

Respectfully submitted,



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Rough Honing of Vermicular Cast Iron: Concept

An obvious choice on grounds of cutting rates and tool service life is to use rough honing instead of fine spindling. The advantages of the honing process in the machining of vermicular cast iron (GGV) can be more fully realized in this way. With regard to angular and positional precision, however, results comparable with those of fine spindling cannot be achieved by extending the usual degrees of freedom of honing tool and workpiece to the rough honing process.

The concept of rough honing instead of fine boring (Fig. 5) therefore provides for a fixed configuration of the tool axis and, similarly, rigid clamping of the cylinder crankcase. Adjustment points make it possible to hold the block with sufficient accuracy relative to the tool axis. The upper and lower tool guides render the tool stable as to the angular position of its axis.

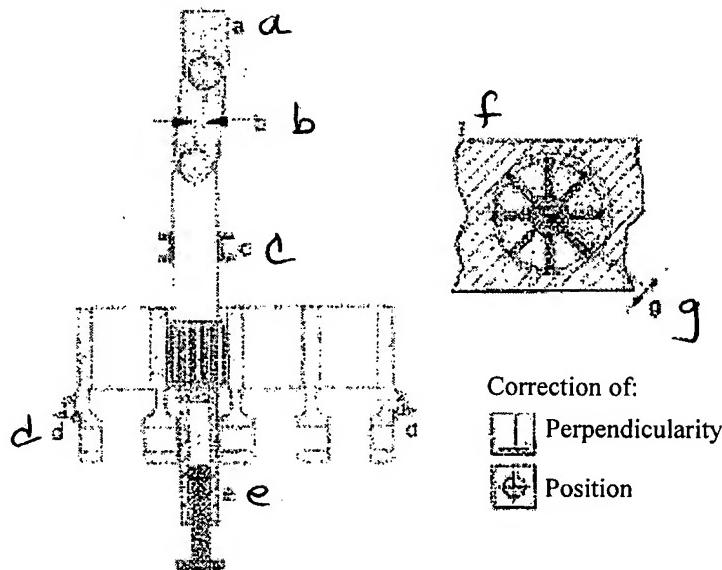


Fig. 5. Machining concept for rough honing of GGV.

(a) Doubly articulated tool holder; (b) axial offset; (c) upper tool guide; (d) adjustment and rigid clamping of engine block; (e) lower tool guide; (f) bore position at start of machining; (g) positional correction.

A doubly articulated holder above the upper guide makes it possible to compensate for the axial offset of the spindle axis and the tool axis.

At the beginning of rough honing, the hone strips work on only part of the peripheral surface of the bore. Machining is extended to the full surface of the bore as material removal proceeds. Because the amount of material removed at the periphery varies from point to point, the bore acquires a new center, which is identical with the tool center. Only a few hone strips transmit the surface force to the bore wall when cutting is commenced. This accordingly requires a positive adjustment device (stepwise adjustment)